WE CLAIM AS OUR INVENTION:

1. A method for determining a circumference of a digit joint comprising the steps of:

irradiating said joint with a light source, and thereby producing light attenuated by said joint;

recording at least one two-dimensional projection image from said attenuated light using a camera;

determining a diameter of said joint from said projection image using an automatic edge detection method; and

calculating the circumference of the joint from said diameter.

2. A method as claimed in claim 1 wherein the steps of irradiating said joint and recording at least one two-dimensional projection image comprise moving said light source around said joint along a circular path through a plurality of angular positions spaced from each other by an angle difference and, from each angular position, recording said two-dimensional projection image, thereby obtaining a number of two-dimensional projection images, determining the diameter of the joint using said automatic edge detection method in each of said two-dimensional projection images, and wherein the step of calculating the circumference comprises calculating the circumference of said joint according to:

$$U = \sum_{n=1}^{n=x} d_n arc\Delta\varphi$$

wherein U is the circumference, x is said number of projection images, d_n is the joint diameter in the respective projection images, and $\Delta\varphi$ is said angle difference.

3. A method as claimed in claim 2 wherein the step of rotating said light source comprises rotating said light source through an angular path of at least 180°.

4. A method as claimed in claim 2 wherein $\Delta\varphi$ is less than 5°.

5. A method as claimed in claim 2 wherein $\Delta\varphi$ is less than 3°.

6. A method as claimed in claim 2 wherein $\Delta\varphi$ is 2°.

7. A method as claimed in claim 1 comprising the additional steps of:

conducting a diaphanoscopic examination of said joint by transilluminating said joint with light having a wavelength in a region of an optical tissue window associated with said joint, and thereby producing scattered light from said joint;

recording a scattered light distribution of said scattered light as a spread function, said spread function having a curve associated therewith;

in a computer, identifying at least characteristic value representing a characteristic property of said spread function by analyzing said curve of said spread function in said computer; and

in said computer, combining said characteristic value and said diameter to obtain information representing a degree of inflamation of said joint.

8. A method as claimed in claim 7 wherein the step of combining said characteristic value and said diameter comprises supplying said characteristic value and said diameter to a neural network to obtain said information as an output of said neural network.

9. An apparatus for determining a circumference of a digit joint, comprising:

a digit support adapted to receive a digit, having a joint therein, of an examination subject in a fixed position;

a light source disposed for irradiating said joint in said finger support with light, to obtain attenuated light attenuated by said joint;

a camera disposed so that said attenuated light is incident thereon for recording at least one two-dimensional projection image of said joint from said attenuated light, said camera emitting output signals representing said projection image; and

a computer supplied with said signals from said camera for determining a diameter of said joint in said projection image by subjecting said projection image to an automatic edge detection method, and for calculating a circumference of said joint from said diameter.

10. An apparatus as claimed in claim 9 further comprising a rotational apparatus on which said light source and said camera are mounted for rotating said light source and said camera around said joint to irradiate said joint with light from said light source from a plurality of different angular positions, and wherein said camera records said projection image from each of said angular positions, to obtain a plurality

of projection images, and wherein said computer is supplied with signals from said camera for each of said plurality of said projection images and determines a diameter in each of said projection images using said automatic edge detection method, and calculates said circumference from the respective diameters in the plurality of projection images.

11. An apparatus as claimed in claim 10 wherein said camera and said light source are mounted opposite each other in said rotational apparatus.

12. An apparatus as claimed in claim 10 further comprising a deflecting mirror mounted in said rotational apparatus opposite said light source, on which said attenuated light is incident, said deflecting mirror deflecting said attenuated light by a 90° angle, and wherein said camera is mounted in said rotational apparatus relative to said deflecting mirror so that said attenuated light deflected by said 90° angle is incident on said camera.

13. An apparatus as claimed in claim 12 wherein said rotational apparatus comprises a hollow-cylindrical housing having an interior in which said light source, said camera and said deflecting mirror are mounted, and a drive mechanism for rotating said housing.

14. An apparatus as claimed in claim 13 wherein said drive mechanism comprises a stepper motor with a transmission mechanism producing a driving engagement between said stepper motor and said housing.

15. An apparatus as claimed in claim 14 wherein said stepper motor rotates said housing in a plurality of successive steps respectively corresponding to said angular positions, and stops and holds said housing at each of said angular positions while one of said projection images is recorded by said camera.

16. An apparatus as claimed in claim 15 wherein said light source emits light continuously as said housing is rotated by said stepper motor.

17. An apparatus as claimed in claim 15 wherein said light source is operated to emit light in pulses correlated with said angular positions.

18. An apparatus as claimed in claim 14 wherein said housing has a longitudinal axis around which said housing rotates, and wherein said digit support is movable in said interior of said housing along said longitudinal axis.

19. An apparatus as claimed in claim 18 comprising a common control unit connected to said light source, said housing and said finger support, for coordinating operation of said light source, operation of said stepper motor, and movement of said finger support relative to each other.

20. An apparatus as claimed in claim 9 wherein said light source is a substantially planar light source.

21. An apparatus as claimed in claim 20 wherein said substantially planar light source comprises a plurality of laser diodes arranged in a plane.

22. An apparatus as claimed in claim 9 wherein said camera is disposed opposite said light source.

23. An apparatus as claimed in claim 9 further comprising a deflecting mirror disposed opposite said light source with said attenuated light incident on said deflecting mirror, said deflecting mirror deflecting said attenuated light by a 90° angle, and said camera being disposed relative to said deflecting mirror so that said attenuated light deflected by said 90° angle is incident on said camera.

24. An apparatus for examining a digit joint comprising:

a digit support adapted to receive a digit, containing a joint, thereon in a fixed manner;

a first light source for irradiating said joint in said digit support with light to produce attenuated light attenuated by said joint;

a second light source for irradiating said joint with light having a wavelength in an optical tissue window associated with said joint to produce scattered light from said joint;

a camera on which said attenuated light and said scattered light are incident for recording a two-dimensional projection image of said joint from said attenuated light and for recording a scattered light distribution from said scattered light, said camera producing first signals representing said

projection image and second signals representing said scattered light distribution; and

a computer supplied with said first signals and said second signals for, from said first signals, determining a diameter of said joint in said projection image using an automatic edge detection method and for calculating a circumference of said joint from said diameter, and for identifying a spread function curve, from said second signals, associated with said scattered light distribution and for identifying a characteristic value of said spread function curve, and for combining said circumference and said characteristic value to produce information representing a degree of inflamation of said joint.

25. An apparatus as claimed in claim 24 further comprising a rotational apparatus on which said first and second light sources and said camera are mounted for rotating said first and second light sources and said camera around said joint to irradiate said joint with light at least from said first light source from a plurality of different angular positions, and wherein said camera records said projection image from each of said angular positions, to obtain a plurality of projection images, and wherein said computer is supplied with signals from said camera for each of said plurality of said projection images and determines a diameter in each of said projection images using said automatic edge detection method, and calculates said circumference from the respective diameters in the plurality of projection images.

26. An apparatus as claimed in claim 25 wherein said camera and said first and second light sources are mounted opposite each other in said rotational apparatus.

27. An apparatus as claimed in claim 25 further comprising a deflecting mirror mounted in said rotational apparatus opposite said first and second light sources, on which said attenuated light and said scatter light are incident, said deflecting mirror deflecting said attenuated light and said scattered light by a 90° angle, and wherein said camera is mounted in said rotational apparatus relative to said deflecting mirror so that said attenuated light and said scattered light deflected by said 90° angle are incident on said camera.

28. An apparatus as claimed in claim 27 wherein said rotational apparatus comprises a hollow-cylindrical housing having an interior in which said first and second light sources, said camera and said deflecting mirror are mounted, and a drive mechanism for rotating said housing.

29. An apparatus as claimed in claim 27 wherein said drive mechanism comprises a stepper motor with a transmission mechanism producing a driving engagement between said stepper motor and said housing.

30. An apparatus as claimed in claim 29 wherein said stepper motor rotates said housing in a plurality of successive steps respectively corresponding to said angular positions, and stops and holds said housing at each of said angular positions while one of said projection images is recorded by said camera.

31. An apparatus as claimed in claim 30 wherein at least said first light source emits light continuously as said housing is rotated by said stepper motor.

32. An apparatus as claimed in claim 30 wherein at least said first light source is operated to emit light in pulses correlated with said angular positions.

33. An apparatus as claimed in claim 28 wherein said housing has a longitudinal axis around which said housing rotates, and wherein said digit support is movable in said interior of said housing along said longitudinal axis.

34. An apparatus as claimed in claim 33 comprising a common control unit connected to said light source, said housing and said finger support, for coordinating operation of said light source, operation of said stepper motor, and movement of said finger support relative to each other.

35. An apparatus as claimed in claim 24 wherein said first light source is a substantially planar light source.

36. An apparatus as claimed in claim 35 wherein said substantially planar light source comprises a plurality of laser diodes arranged in a plane.

37. An apparatus as claimed in claim 24 wherein said camera is disposed opposite said first and second light sources.

38. An apparatus as claimed in claim 9 further comprising a deflecting mirror disposed opposite said first and second light sources with said attenuated light and said scattered light incident on said deflecting mirror, said deflecting mirror deflecting said attenuated light and said scattered light by a 90° angle, and said camera being disposed relative to said deflecting mirror so that said attenuated light and said scattered light deflected by said 90° angle is incident on said camera.

39. An apparatus as claimed in claim 24 wherein said second light source is a laser diode.